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No. CLXX.

9 MARCH 1, 1880.

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THE TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW.

LONDON: HAUGHTON & COMPANY, 10, PATERNOSTER ROW, E.C.

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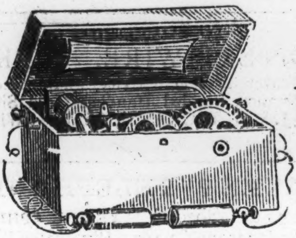

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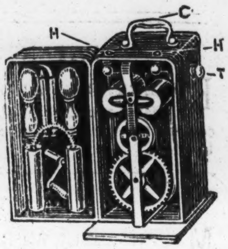

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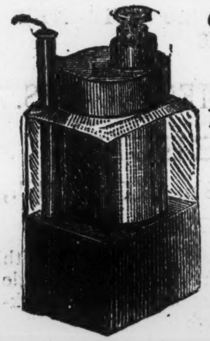

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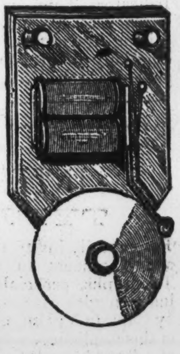

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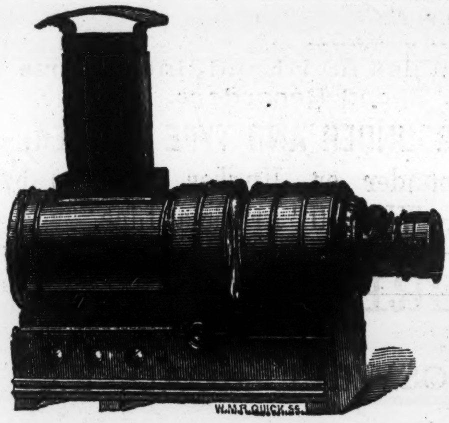

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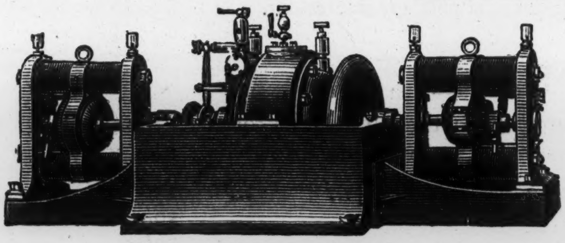

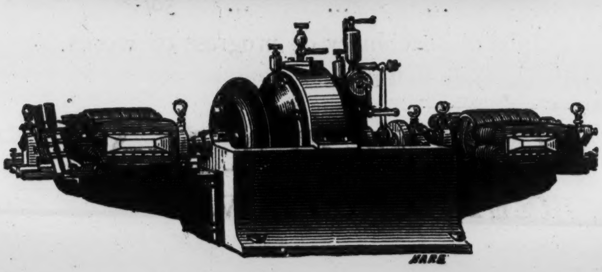

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THE TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW.

VOL. VIII.—NO. 170.

CABLE PROPERTY.

THE past year has been a very advantageous one for the telegraph companies, at least, if we may judge by the considerable increase of the traffic receipts. In nearly every instance an addition to revenue has resulted on the year's business as compared with the previous year. The Anglo, Brazilian Submarine, Cuba Submarine, Direct Spanish, Direct United States, Eastern, Eastern Extension, the Great Northern, and The Submarine Companies all mark important increases. The returns of the West Coast of America and of the Western and Brazilian we have not at hand, whilst those of the West India and Panama Company show a slight decrease.

We do not think we shall be considered optimists when we assert that probably at no time in the comparatively recent history of submarine telegraphic enterprise has the future appeared more hopeful. Indeed, so rapidly does the business of the companies promise to extend that were it only possible to obtain greater permanency for the ocean threads, there would soon scarcely be found a better paying class of investment.

As, however, that lasting cable has not yet been proved to have been discovered, it is for the time necessary to pay particular attention to the accumulation of the respective reserve funds.

At what amount each should stand cannot well be told by any beyond the directorate or the scientific staff of any company, and not even by them, with any degree of accuracy.

This must depend on the nature of the ground over which the cable passes, the type of cable laid, the length of time it has been down, the amount of repair which has from time to time been effected on it, and also on so many considerations that it is impossible, as we before said, to estimate at what exact sums the reserve funds should stand; but, speaking generally, it will, we believe, be found that they are yet by far too meagre.

It has, therefore, been with considerable satisfaction that we have noted the constantly progressive increase of receipts, as it will enable the companies to obtain that position of security without which their properties seem destined to remain at their present low prices.

Another source of increasing value is to be found in the additions to existing systems, which should prove of pecuniary advantage to the parent stems, even though those additions may not be in themselves paying concerns. This would, of course, only be the case where the added but non-paying line was owned by a separate company. But where it is so, every extension of a system must render the pre-existing portion of that system of greater value than before.

On taking together the amounts of the receipts of twelve companies for 1879, and comparing them with those of 1878, we find the former exceed the latter by about £215,000, and this on a return of about £2,000,000. In the case of one of those companies whose returns we have not, namely, the Western and Brazilian, we hope that with Sir Edward Watkin's well known energy and talent it will now emerge from the cloud which has seemed to hang over it, and we trust that a similarly happy outcome may be found for the sorely tried West India and Panama Company.

Were it not for the competition which the American Cable Companies will have to meet, there seems every reason to think that the augmented receipts would not only be maintained but even still further increased—particularly as trade will, in all probability, more generally improve during the present year; but if sixpenny word tariffs are to prevail, immense loss must ensue to those companies engaged in the strife. It is to be hoped so suicidal a policy will not obtain, or, if it does, that it will be but of short duration.

In closing these few desultory remarks, we take this opportunity of congratulating the directorates and staffs generally, on the improved outlook, and of expressing the wish, that this time next year it will be our pleasing task to refer to submarine cable property as not only well paying, but also as well secured.

ON SOME OF THE EFFECTS PRODUCED BY AN INDUCTION COIL WITH A DE MERITENS MAGNETO-ELECTRIC MACHINE.

By WILLIAM SPOTTISWOODE, P.R.S.*

IN the *Philosophical Magazine* for November of last year I gave an account of a mode of exciting an induction coil by the direct application of one of M. de Méritens alternating machines, without the intervention of a contact-breaker or the use of a condenser. The experiments of Professor Dewar on the arc furnished by the machine itself, on its spectrum, and on its behaviour in respect of electrolysis, described before the Royal Society (*see* "Proceedings," Feb. 13, 1880), have led me to think that an account of some of the peculiarities in the induced discharge, to which the machine gives rise, might be acceptable to the Society.

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* Proceedings of the Royal Society.

And, first, as regards the secondary discharge in air. It was mentioned in the paper first quoted that the spark produced by this machine presented an unusually thick yellow flame, and that it was accompanied by a hissing noise different from that commonly heard with a coil excited by a battery. As the machine gives alternate currents, the secondary discharge presents sparks of equal strength in both directions, and the general appearance to the eye is symmetrical in respect of both terminals. The spark was observed in a revolving mirror, first in a vertical and secondly in a horizontal direction. The discharge, although apparently continuous, was immediately seen to be intermittent, with a period in unison with that of the machine. Tongues of flame, leading alternately from one terminal and from the other, crossed the field of view. The length of spark first used (vertically) was about half an inch. When the length was increased to about two inches flashes or bands of continuous light were seen to traverse the field of view in diagonals of low slope (*i.e*, nearly horizontally), showing that there were masses of heated matter passing from time to time at moderate velocity between the terminals. From the known period of the machine, and the number of the discharges crossed by these flashes in their passage from terminal to terminal, it was calculated that the time of passage was about ·03 of a second. Occasionally there was a still brighter flash or meteor, which similarly traversed the field, but with a velocity apparently of about double that of the others.

When the discharge was set horizontally similar phenomena were seen; but at a distance about midway between the two terminals the flames appeared to meet, and at their point of meeting they showed continuous luminosity throughout. When the flame was blown aside there appeared occasionally, and at rather long intervals, the true spark, evinced by an irregular bright line, reaching from one terminal to the other.

On observing the discharge in air attentively it was noticed that whenever a true spark passed its passage was marked, as usual, by an irregular bright line when its path was outside the aureola or flame, but by a similar dark line when its path was within the aureola. Whether this be a merely subjective effect, due to the fatigue of the nerves of the retina by the bright spark, which always precedes the aureola in point of time, or whether it has any electrical significance, perhaps requires further examination.

The spectrum of the secondary spark was then examined with terminals of various metals.

Aluminium.—The spectrum showed a faint continuous background with the yellow sodium lines, and faint oxide of aluminium lines. This was with a spark of half an inch. But although the spark was subsequently lengthened, no difference in the spectrum was perceived, excepting that the continuous background was rendered more bright.

It would seem that these appearances are due to some such process as the following:—The heat due to oxidation, added to that of the discharge, is sufficient to volatilise the oxide of aluminium; but that in its passage across the interval between the terminals the oxide becomes so cooled that it gives a continuous spectrum. When the spark was lengthened, the oxide, although perhaps at first more heated than with the shorter spark, had more time to cool.

Magnesium.—In this, as in the former case, we have a faint continuous spectrum as a background, on which were seen the *b* group of magnesium lines. One other line in the blue occasionally flashed out, but was not permanently present. There was also a faint trace of the oxide spectrum. The contrast between the cases of aluminium and magnesium, in respect of the prominence of the oxide, or of the true metallic spectrum, is doubtless due to the fact that in the former case the oxide, and in the latter the metal, is the one which is more easily vaporised. On sending a blast of air on the discharge the blue line always disappeared, the current of air having lowered the temperature so far as to prevent the vaporisation necessary for its production.

When the spark between magnesium terminals was made to pass through hydrogen the characteristic lines of hydrogen were seen, apparently owing to a rise in temperature. This, as mentioned below, does not occur with carbon poles.

Platinum.—With terminals of this metal the spectrum was mainly continuous, with the addition of the ubiquitous yellow sodium lines. When the spark was short a few bands were faintly visible, some apparently those of nitrogen, and others in the blue and violet belonging to the oxide of platinum. When the spark was lengthened these bands disappeared, and nothing but the continuous spectrum (with the D lines) was visible.

It appears from these experiments that the application of the De Méritens machine to the induction coil furnishes us with the means of isolating certain lines of the metallic spectrum from the rest. It has, in fact, enabled us to reduce at pleasure the spectra of aluminium, of magnesium, and of platinum, to their most persistent lines; precisely as had already been noticed as occurring by natural processes in the cases of sodium and of calcium. As a general rule, when the spark is shortened the metallic, or the oxide, lines come out, when it is lengthened they disappear.

From this we may conclude (1) that the discharge which we have been examining is a real flame with metallic particles passing between the terminals in a solid condition; and (2) that in general the temperature is comparatively low, *i.e.*, that it is insufficient to cause any considerable vaporisation. This is notably the case when the arc is long, and when the matter thrown off from the terminals has sufficient time in its passage to cool.

The spark was then tried between carbon terminals in atmospheres of hydrogen and of carbonic acid. In none of them did the spectrum show any gas lines; but with hydrogen there were faint traces of the hydrocarbon group in the green. In this respect the spark differs from the discharge direct from the machine, inasmuch as the latter gives some of the hydrogen lines in hydrogen and carbon lines in carbonic acid.

When the spark was discharged in a magnetic field known phenomena were reproduced, but owing to the thickness and mass of the flame and the extraordinary strength of the magnetic field they were exhibited in a state of great splendour.*

When the spark passed in an equatorial direction the whole flame was spread out in an equatorial plane, in which heated masses might be seen revolving in one direction or in the other in the neighbourhood of each of the magnetic poles. To give some idea of the actual appearance, it may be mentioned that a symmetrical spindle-shaped discharge, 15 millims. in length and 3 millims. in thickness, was spread out by the magnet into a disc of about 15 millims. in diameter and 1 millim. in thickness. When the spark passed in an axial direction, or when the poles themselves were made the terminals, the phenomena described in my paper "On an Experiment in Electro-Magnetic Rotation" ("Proc. Roy. Soc.," March 30th, 1876) were reproduced.

Whatever was the direction of the spark the resistance due to the magnetic field was such as to extinguish the discharge, provided that the striking distance was near the limit that it could attain when no magnetic field was present. If a plate of glass was interposed between the poles of the magnet (which were still used as terminals) the yellow flame disappeared, and the spark divided itself into numerous ramifications of true sparks which found their way round the edges of the plate. As soon as the magnet was excited the resistance in the field became so great as to exceed that of the glass plate itself, and the plate was pierced.

When magnesium terminals were used in an atmosphere of hydrogen, the yellow sodium lines, the blue and green magnesium lines, and the red line of hydrogen were visible near the terminals, with a continuous background. When the magnet was excited the only change observed was that the lines became slightly fainter.†

Professor Dewar was good enough to measure the efficiency of the secondary discharge, by taking an inch spark in a glass bulb placed in the centre of a calorimeter, in the same way as he had already measured the efficiency of the intermittent current direct from the machine. The former amounted to about 430 gramme-units per minute, while the latter had been found to be 6,000 per minute. The relative efficiency may, therefore, be taken at about 1 : 15. And as the machine was giving about 300 currents per second, this would give for the secondary

$$430 : 60 \times 300 = \cdot023 \text{ units per discharge,}$$

and for the primary

$$6000 : 60 \times 300 = \cdot3 \text{ units per discharge.}$$

The results in the case of the secondary discharge may not perhaps possess any great degree of accuracy; but, in the absence of any other information on the question, they may serve to indicate the general scale of magnitude by which the coil discharge is related to that of the machine.

Leaving the subject of the spark from the induction coil, one of the most remarkable effects produced by this machine was the illumination of vacuum tubes by the currents taken simply from the machine. A small sphere of about two inches in diameter, with an air-vacuum, and having two parallel straight terminals reaching nearly across the sphere and about half an inch apart, was (after the first attempt, when there was some difficulty in getting the discharge to pass) readily illuminated. Owing to the alternate currents, both terminals were of course surrounded with the usual blue halo. When the speed of the machine was reduced the discharge through the tube was not maintained, showing that only that part of the current from the machine which possessed the highest electromotive force, and perhaps also the greatest strength, was sufficient and was therefore actually used for the purpose. As this was apparently only a small fraction of the whole current, we may herein find an explanation of the fact that, compared with the effect from the induction spark, the illumination was moderate and the heating insignificant. It would perhaps not be easy to establish an accurate comparison between this and other sources of electricity; but some idea may be conveyed by the fact that, from experiments made with this tube with Mr. De La Rue's chloride of silver battery on a former occasion, and quite independently of the present question, it was estimated that a current having an electromotive force of 400 volts was necessary to produce a discharge.

Other tubes were tried, and were illuminated in the same way.

When the tube was placed in the magnetic field the discharge underwent the modifications described by Plücker, by Hittorf, and by others. But it may be mentioned as a result of the extraordinary strength of the field here employed that, whenever the tube was so placed that the direction of discharge made any considerable angle with the lines of magnetic force passing through it the discharge was completely extinguished. When the tube was removed to a weaker part of the field the discharge reappeared, distorted in form, and altered in colour in a manner known to those who have experimented in this direction.

It is a curious fact that in some lines of manufactures the Canadians are beating Yankees in economy of production. For example, the Waterous Manufacturing Company, of Brantford, Ontario, have, we learn, for some time past been delivering steam-engines in Bremen at less prices than the American makers can put them down there.—*Scientific American.*

MM. ANTOINE BREGUET, son of the celebrated member of the Institute, and RICHET have taken the joint direction of the *Revue Scientifique*, the largest and most influential French scientific periodical. M. Antoine Breguet will write more specially on physics, and M. Richet on chemistry. It is understood that M. Alglave, the former editor, has resigned in order to devote himself more entirely to the propagation of Spencerism and Monism.

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* Through the kindness of the authorities of the Royal Institution, Faraday's great electro-magnet, excited by the Siemens machine, was placed at my disposal.

† There was some reason to think that, at the moment of making the magnet current, the lines became decidedly brighter, and that they lost their brilliancy if that current was maintained. But this, perhaps, requires further examination.

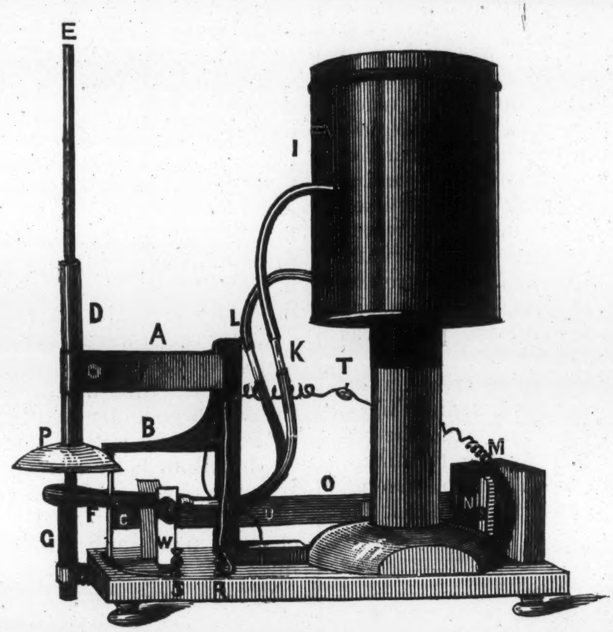
STEWART'S ELECTRIC LAMP.

THIS is a self-regulating lamp, capable of burning for a very long time without attention. It is simple in construction, inexpensive to manufacture, and, as the consumption of carbon is less than in most regulators, it may be said to be economical.

A general view of this lamp is shown by the figure. The action of the arrangement is as follows :—

The binding screws, R and S, being respectively in connection with the positive and negative poles of the dynamo machine, the current enters at R, passes along the support A, through the wire T and the electro-magnet M, then back through the wire U, the support B, and spindle C, to the binding screw S.

The armature N, being momentarily attracted by the magnet M, pulls on one side, by means of the lever O, the metal electrode F, which forms a ring round the carbon rod.



There is a flow of water through the electrode F, which latter works on a central spindle, C. The electrode F being now in contact with the carbon rod E, the current changes its direction in the following manner. It passes from R along the support A, through the metal tube D, to the carbon rod E. The carbon rod E may be of great length, so as to burn for a considerable time without renewal. The electric arc is formed between the inside edge of the ring electrode F and the carbon rod E, passing from E to F, and thence by the spindle C to the binding screw S. As soon as contact is established between the electrodes E and F, the armature N is released, and the electrode E is forced back to its normal position by means of the spring Q. The upright, W, is to prevent the electrode F going too far. G is a piece of insulated carbon to keep the carbon rod E from falling; its position can be regulated by means of a screw. I is a small cistern, from which water flows through the metal electrode F to keep the latter cool. K and L are flexible tubes, which convey the water to and from the cistern, the circulation being maintained by the different levels at which these tubes enter the cistern. P is a reflector to throw the electric rays downwards.

The electrode F is easily attached to the spindle C, and can be renewed if and when necessary. In practice, however, it has not been found to burn.

An advantage which this lamp possesses consists in the ease with which the carbons can be renewed when consumed, as they have merely to be dropped into the tube D. The carbons, indeed, need not be in long lengths, as pieces a few inches long may be piled one on the top of the other in the tube, and each piece will come into use as the one beneath it becomes consumed.

The arrangement of the different parts of the lamp, as shown by the figure, are not, perhaps, as compact as they might be, but this is simply due to the fact that the figure given is that of a trial lamp. The details could easily be modified without altering the general principle, which possesses points of novelty which seem highly advantageous.

It might be imagined that the water in the cistern would become heated quickly, and would require constant renewal. Such, however, is not found to be the case; a comparatively small volume of water is found to cool the electrode sufficiently to protect it from injury.

This lamp, which is not patented, is the invention of Mr. Charles Stewart, M.A., of 50, Colebrooke Row, London, N.

A lamp on a somewhat similar principle was patented recently by Messrs. Siemens. In this lamp the negative terminal consists of a vertical wire, preferably of iron, enclosed within a thin copper tube, which is surrounded by an outer tube or casing of larger diameter, so that between the two tubes there is an annular space through which water is made to flow. By connecting the upper and lower ends of the casing by flexible tubes with the upper and lower parts of a water cistern, the heating of the water at the terminal causes a circulation which is sufficient for keeping the latter cool. The wire forming the core of the terminal is pressed upwards by a weight, float, or spring against a small shoulder or burr at the mouth of the inner tube, and as the wire wastes at its upper end it is continually fed upwards by the weight, float, or spring. The positive terminal consists of a carbon rod which is free to slide downwards within a water-cased tube, the lower end of the carbon resting against the end of a pin of platinum or other refractory metal screwed obliquely through an eye at the lower end of the casing. As the carbon wastes at its lower end it slides downwards, still bearing against the pin.

The system of cooling is to a certain extent disadvantageous, as it causes a diminution in the amount of light produced by a given current.

TELEGRAPHIC APPARATUS IN USE IN THE BRITISH POSTAL TELEGRAPH DEPARTMENT.

IV.

THE MORSE DIRECT WRITER.

THE Morse Writer is more extensively used in the Postal Service than any other form of instrument. It is either worked "direct" or by "relay." In the direct working system the signals are recorded by the direct action of the line current, and inasmuch as the latter is liable to considerable variation and diminution on long wires, the system is only adapted for circuits under 100 miles in length.

The general arrangement of the apparatus is shown by fig. 17. In this fig. M is the electro-magnet, G a galvanometer, and *l* a lightning-protector; the outside case of the latter is connected to terminal E, by which it can be put to earth.

In some of the older forms of apparatus, which were not fitted with protectors, the terminal E was not provided, and terminals U and D were respectively lettered E and L.

Action of the Apparatus.

The working of the arrangement is as follows:—When the key, K, is depressed the Copper pole of the battery becomes connected with the front stop of the key, thence with the axle block of the same, through the galvanometer, G, and with the lightning-protector, *l*, with terminal D and the "Down" line. Terminals Z and U being permanently connected together, the Zinc pole of the battery is in communication with the "Up" line.

When signals are being received on the instrument, then the course of the current, supposing it to enter from the "Down" line, will be:—From terminal D, through the lightning-protector and the galvanometer, on to the hinge block of the key, thence by the back stop of the latter, through the electro-magnet, M, on to terminal U and the "Up" line.

The connections shown are those for an "Intermediate" station. If the instrument is at an "Up" station then terminal D must be connected to line and terminal U to earth. At a "Down" station U must be connected to line and D to earth.

Theoretically, and practically also, it makes no difference whether U or D be the Up or Down line terminals respectively, or whether Z or C be the Zinc or Copper terminals respectively; but as uniformity is very desirable, it is the rule to join up the instruments in the manner indicated.

The earliest forms of Morse instrument were of the "embosser" form, that is to say, the dots and dashes were formed by means of a style, which was forced into the paper and formed short or lengthened indents. Apart from the fact that no marking ink was required for this form of instrument, it had but little to recommend it, as it required considerable battery power to produce good marks; and the marks, such as they were, were by no means easy to decipher. Its continued use simply arose from the absence of an efficient method of producing the signals by ink marks.

The form of inker at present in use, and which is the best pattern yet introduced, was invented by Messrs. Siemens.

Fig. 18 shows a perspective view of a Direct Writer Morse of the most recent design. Fig. 19 is a side view of the same removed from its wooden base; and fig. 20 is a general top view, showing parts of the mechanism.

The under base of the instrument contains a drawer, A, in which is contained the paper slip; this drawer is shown by fig. 21. The roll of paper, P, rests on a circular brass disc, *f*, which runs easily on a pivot, *p*. The end of the slip is brought out under two wooden rollers, r_1, r_2, the axes of which are at right angles to one another. Of these rollers, r_1 is set at the end of a brass spring, so that if the paper is pulled out with a jerk, as happens sometimes, this spring yields, and prevents the jerk being communicated to the roll of paper and the disc on which it rests; the effect of such a jerk would be to cause the disc to spin round and unwind several turns of paper in the drawer, and thus cause a tangle. The paper, after passing under roller r_2, runs through a slit, *d* (fig. 18), in the wooden base, from thence it passes over a metal roller, *p* (fig. 19). This roller is provided with two adjustable collets, one on each side of the paper slip. The object of these is to enable the position of the slip relative to the inking disc to be adjusted, so that the marks on the slip may be made to come along the centre of the latter. After passing over this roller, the slip next passes under a small steel roller, whose pivot is seen at *o*; it then passes between the two rollers, *n*, *m*, and away from the instrument. Roller *m*, which is on a brass frame on an axle at *j*, is pressed against roller *n* by means of a spring, which gives sufficient grip between the former and the slip to enable the latter to be drawn forward by the action of the clockwork which turns the roller *n*. The surfaces of both the rollers are milled, to give the necessary friction.

A little handle is attached to the frame of the roller *m*, by which the latter can be lifted up to enable the paper slip to be placed in position when a fresh supply is brought into use.

The inking is effected by means of a disc, *i*; this disc is connected by an axle *g* (fig. 20), with the clockwork train; the further end of this axle is hollow and fits loosely over the end of the axle of a wheel, *w*, in train with the rest of the mechanism, the two being held together by a loosely fitting pin, *f*. The whole, in fact, forms a kind of universal joint, which enables the disc, *i*, to be kept rotated by the clockwork, and at the same time enables it to have a slight up and down motion when required.

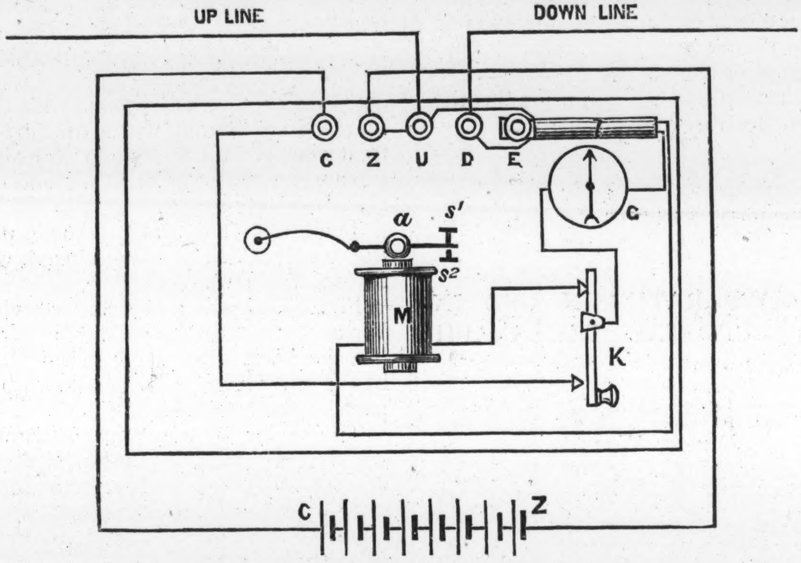


FIG. 17.

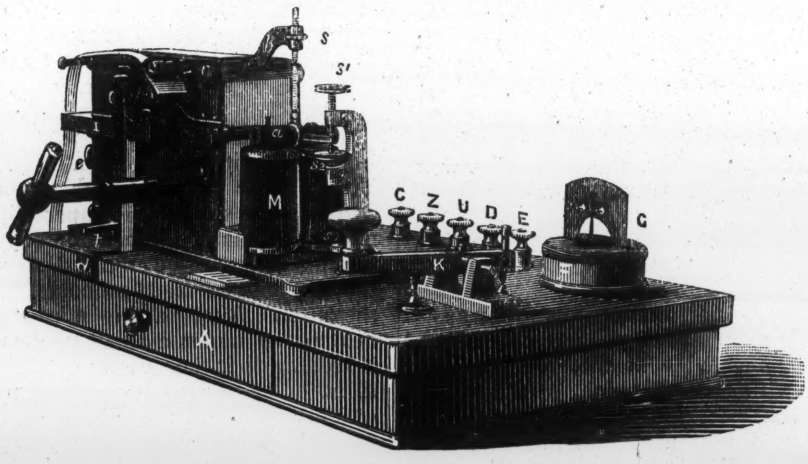


FIG. 18.

The disc, *i*, dips into a small chamber which forms a part of, and is in communication with, the larger reservoir, I, which contains the marking ink. This reservoir is secured to the frame of the instrument by the thumb-screw, *e*, so that it can easily be removed when required. The rotation of the disc keeps the periphery well covered with ink.

The elevation of the disc against the paper slip is effected by means of the steel lever, *k'*, the one end of which is formed into a ring, *x* (fig. 20), through which the axle of the disc passes; the other end of the lever is secured to the brass piece, *k*, by means of two screws, *h'*; a third screw, *h*, is also provided by which a slight amount of regulation relative to the piece, *k*, and the armature, *a*, of which the former practically forms a part, can be given to the lever, *k'*.

The armature, *a*, is formed of a soft iron split tube, this shape being found to be more satisfactory than the ordinary flat form.

The axis on which the armature and its attachments are fixed is pivoted to brass cocks, K (figs. 19, 20). The "end shake" of the pivots is limited by steel plates, *v*, screwed against the cocks, K. It is much better to limit the "end shake" in this manner rather than to allow the shoulders of the pivots to bank against the pivot brasses, as the free motion of the armature would be considerably impeded in the latter case, also it would be much more liable to stick.

The spring, *z*, which keeps the armature, *a*, in its normal position, is adjusted by the thumb-screw, *s* (fig. 18), attached to the bracket, *b*, fixed to the frame of the apparatus. The play of the armature is limited by the screws, s_1, s_2, secured to the bracket pillar, *g*.

The electro-magnet, M, is not fixed to the base of the instrument, but is attached to a broad plate, L (fig. 19), which is hinged at H. This plate is about as wide as the magnet is broad, and is secured to the latter by means of two screws, one screwing into each core. The free end of this lever has a screw pivoted to it which screws into the thumb-screw, s_3; a spiral spring, Z, surrounding the screw and exerting its expansive force between the lever-plate, L, and the brass bed plate on which the clockwork is secured, tends to move L down, and thereby to lower the magnet, M; by turning the screw, s_3, it is evident that the lever, L, can be drawn up, and thus the magnet be raised.

The ends of the coil wires, which are seen in fig. 19, are kept covered by an ebonite boxing, shown in fig. 18; the object of this is to protect the ends from injury, it having been found that the latter were very liable to be broken by dusting. The tongue, *t*, frees or stops the train of clockwork according as it is moved to the left or right.

Adjustment of the Instrument.

There are four distinct means of adjustment which can be given to the instrument in order that proper signals may be obtained.

1st. Screws, s_1 and s_2, which limit the up and down play of the armature, *a*.

2nd. The spring, *z*.

3rd. The screw, s_3, which regulates the proximity of the poles of the magnet to the armature, *a*.

4th. The screw, *h*, which regulates the position of the inking disc, *i*, relative to the paper slip and to the armature.

The latter means of adjustment is rarely required for general purposes, being practically only used when the instrument is adjusted after being taken to pieces for cleaning and repair in the workshop.

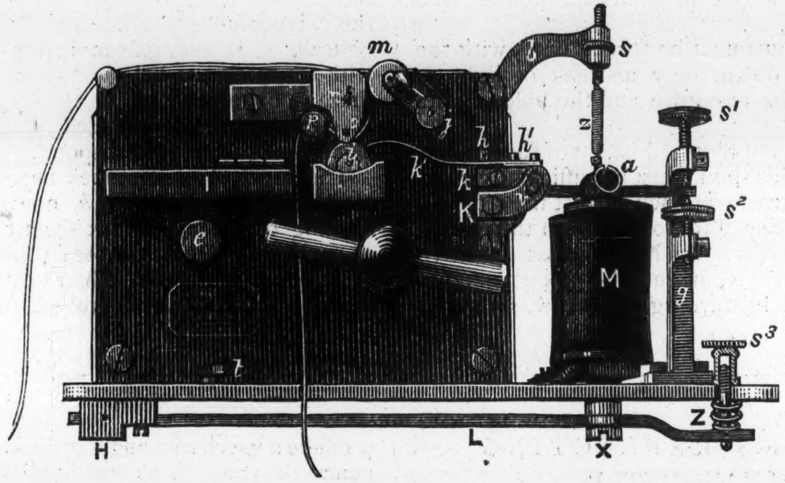


FIG. 19.

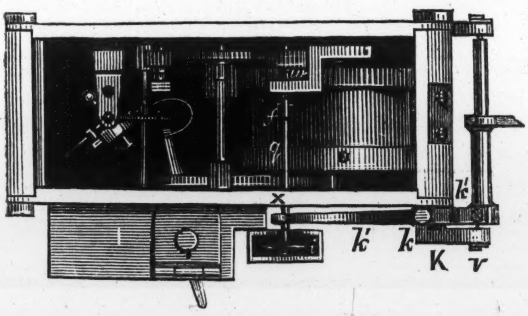


FIG. 20.

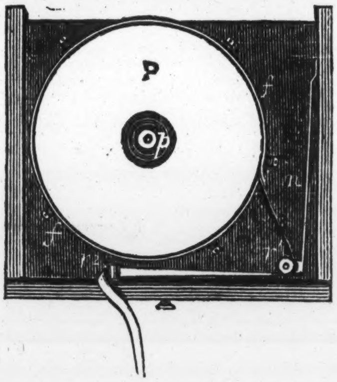


FIG. 21.

The regulation for ordinary working purposes is as follows:—

The screw, s_2, must first be adjusted until the disc, *i*, touches the paper lightly but firmly, that is to say, until the signals on the paper when the armature is gently depressed are clear and unbroken, whilst, at the same time, the armature lever fairly touches the screw, s_2. If the armature on being depressed does not produce a slight ring against s_2 the disc will be pressing too hard against the paper, and will produce thick marks.

The screw, s_1, may be next adjusted until the armature lever has about 1-16th of an inch play between the two screws.

This adjustment of the screws, s_1, s_2, applies to any circuit, and is not regulated by the condition of the line current.

The screw, s_3, must next be turned until, with the armature, *a*, held down, only a streak of light is visible between the armature and the poles of the electro-magnet.

The last adjustment required is that of the tension of the spring, *z*. This should just be sufficiently great to bring the armature lever back against the stop, s_1, when the current ceases to flow through the instrument. The latter is now in its most sensitive condition. For strong currents the electro-magnet should be lowered by turning the screw, s_3, and, if absolutely necessary, the spring, *z*, must be tightened up.

The magnet coils in the Direct Writer Instrument are wound to a total resistance of 300 ohms, and the apparatus should work well with a current of 3·3 milliwebers.

Faults.

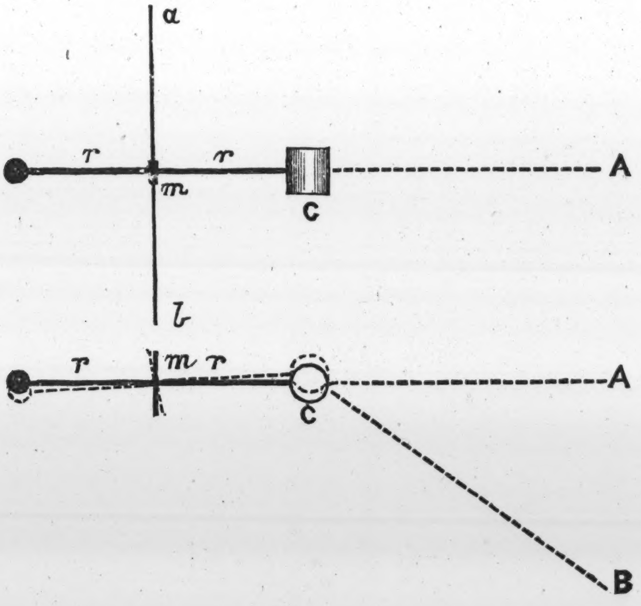
Apart from the adjustments, the faults to which the Direct Writer Instruments are liable are not numerous or troublesome to detect.

The battery being connected to Z and C, the instrument may be proved to be in good working order, as regards the out-going current, by connecting terminals D and U together and depressing the key, the galvanometer needle should then respond energetically. If the galvanometer needle responds without D and U being connected together, then there is a short circuit in the lightning protector. If C and D are connected the armature of the electro-magnet should respond.

The lever, *k'*, sometimes becomes loose on the piece, *k*, from the screw, *h*, not being tight. Slow running of the clockwork from the fly getting out of order, or from the train becoming clogged, occasionally happens. When in good order the slip should run through at the rate of six feet per minute.

RAPIEFF'S REFLECTING GALVANOMETER.

THE principle of magnifying the small deflection obtained on a galvanometer needle by means of a reflected ray of light, as in the Thomson galvanometer, has recently been still further developed by Mr. J. Rapieff. By this device an extremely small deviation of a magnetic needle may be made to produce a very large angular deflection of a reflected pencil of light. The way in which this is effected is shown by the figure. In this figure, *m* is the magnetic needle, suspended in the ordinary manner in the centre of a coil by means of a silk fibre, *a b*. At right angles to this needle is fixed a light bar, *r*, *r*, to one end of which is attached a counterpoise and to the other end a cylindrical mirror, C. A lamp at A throws a pencil of light on this mirror, as in



the Thomson galvanometer. So long as the position of the cylinder is such that the pencil of light is a normal to the surface of the mirror, then the reflected beam will be a normal also, that is to say, it will fall on the zero of the galvanometer scale. A very slight deviation of the cylinder, say, to the left, will cause the reflected beam to be deviated a very considerable angle in the direction B, as shown by the figure. It is evident that, by lengthening the rod, and making the cylinder, C, of a small radius, the sensitiveness of the arrangement can be indefinitely increased.

Notes.

THE Brush electric light system has been applied for illuminating purposes in the anthracite mines of Pennsylvania.

The same system is also in use at the mill of Mr. Louis J. Crossley, of Halifax, Yorkshire.

IT has been decided to permanently adopt the electric light in the reading-room of the British Museum. The system used, as perhaps our readers are well aware, is that of Messrs. Siemens.

"IRON" states that experiments are in progress at the North Shore Mills, Liverpool, under the direction of Mr. Ward, engineer of the British Electric Light Company, with the André incandescent lamp, which is said to possess several special advantages. The light is contained in a globe hermetically sealed, and, as the carbon rods are thus protected from contact with the air, they are not subject to combustion, or the combustion is so slow as to be almost imperceptible. The lamp is simple and effective. It is self-adjusting, devoid of mechanical appliances, and, as the carbon points are not consumed, it will remain illuminated for an indefinite length of time. The avoidance of any renewal of the carbon points is an obvious advantage, as is the fact that the new system admits of a complete subdivision of the current of electricity.

THE ELECTRIC LIGHT.—In the *Philosophical Magazine* for January, 1879, p. 30, Mr. W. H. Preece gives a discussion, in which he shows the condition to be supplied in electric lighting in order to obtain a maximum effect. In eq. 2, p. 31, he gives for the heat distributed to the incandescent material $H = \frac{E^2 l}{(p+r+l)^2}$ where p represents the battery resistance, and r and l represent the resistance of the connecting wires and incandescent lamp respectively. For n lamps joined up in series we must substitute $n\,l$ for l, while if joined in multiple arc we must put $\frac{l}{n}$ for l. In either case the value of H is found to be a maximum when the resistance of the lamp system is equal to the rest of the circuit. Mr. Preece then proceeds on the assumption that this condition cannot be complied with if n is large, reaching the conclusion that the amount of heat liberated in each lamp varies inversely as the square of the number of lamps. This is true in either of the two cases discussed by him. If, however, we have n lamps arranged in n' parallel circuits, in each of which we have n'' lamps, the previous equation becomes

$$H''' = \frac{E^2 \frac{n''}{n'} \, l}{(p + r + l \frac{n''}{n'} \, l)^2}$$

With this arrangement it is *always* possible to supply the condition which makes H''' a maximum, entirely irrespective of the value of n. If $p + r = \frac{n''}{n'} l$, we shall have $H''' = \frac{E^2}{4\,(p + r)}$; or, the total heat in n lamps is independent of the number of lamps. The heat generated in each lamp will then vary inversely as the number of lamps.—F. E. NIPHER, in *Van Nostrand's Engineering Magozine.*

THE Edison Electric Light Company, it is said, is not to have a patent for the carbonised paper horse-shoe lamp without a contest. The parties contesting Edison's claim for a patent on his new lamp are large capitalists, and are represented in Washington by attorneys whose speciality is electric light patent cases. It is evident that it will be a long time before this contest is settled; and if Edison does get a patent for his lamp, it will not be until after years of hard fighting.

THE following are the claims made before the Commissioners of Patents on behalf of the Sawyer-Mann lamp in the proceedings for an interference: 1. Incandescing arcs for electric lights made of carbon substantially, as hereinbefore set forth. 2. Incandescing arcs of carbon in combination with the circuit of an electric light. 3. The combination substantially, as hereinbefore set forth, of the circuit of an electric light, an incandescing arc of carbonised paper included in the circuit, and a close transparent chamber in which the arc is enclosed. 4. An incandescing arc made of carbonised fibrous or textile material.

M. PERUCHE has invented a new electric candle which consists of three carbons, two being cylindrical, 4mm. in diameter, and applied to each other, the third square, 5mm. thick, placed in the angle formed by the others. The holders are capable of oscillation, the square carbon being held by a spring in contact with the others while no circuit passes, but when the current begins, takes its separate position.

AT the next meeting of The Society of Telegraph Engineers there is to be a display of electric light apparatus; inventors and manufacturers are invited to exhibit.

DISTRIBUTION OF POWER BY ELECTRICITY.—Numerous experiments have lately been made in Paris on the transmission of power by means of two Gramme machines, one producing an electric current by mechanical action, the other operating inversely, and reconstituting a portion of the labour which was originally expended. In order to make careful measurements, M. Tresca estimated some of the experiments with a Gramme machine making 1,200 revolutions per minute. The current was transmitted by copper wires to carts at different distances, two Gramme machines being placed on the carts and acting on a windlass, which pushed a double Brabant plough so as to make a furrow 220 metres (240·6 yd.) long. The velocity of the plough, when the circuit of the current was 800 metres (874·91 yd.) was 88 centimetres (34·65 in.) per second, the shaft making

1,123 turns per minute; when the circuit was increased to 1,300 metres (1,421·72 yd.) the velocity was increased to 70 centimetres (27·56 in.) and the revolutions of the shaft to 890. The effective work was estimated at three horse-power.—*Comptes Rendus*.

AN experiment with the telephone between the Union Pacific Transfer on the east side of the Missouri River, opposite Omaha, Nebraska, and St. Louis, made on 25th January, over a distance of 410 miles, is reported to have been successful. An ordinary conversation is said to have been carried on with ease.

A NEW use has been found for the telephone. Captain Greer, of the Ordnance Department, U.S. Army, Springfield, Mass., employs it to determine the time of flight of small arm projectiles at long ranges. Two telephones, provided with Blake transmitters, were used. One was placed within a few feet of the gun and left open to receive and transmit the sound of the discharge. The other was in the shelter-proof, which was about thirty feet in front of the right edge of the target. A stop watch, beating fourths of a second, was used in connection with it. The telephone being at the ear, the instant the sound of the discharge was received at the target the watch was started, and, on the bullet striking, was stopped.

CURIOSITIES OF THE TELEPHONE.—With a single telephone held, say to the right ear, the transmitted voice appears to come from a distance to the right; while with a telephone held to the left ear, it seems to arrive from the left of the listener.

With a telephone to each ear, if one ear be less sensitive than the other, or if the telephone be held further from that ear, the voice apparently shifts to the side of the other ear; and if both ears hear alike and both instruments are equally near their respective ears, the voice apparently proceeds from in front of the observer.—*Scientific American.*

THE Montreal Telegraph Company, we learn, has actively promoted the supply and use of telephones, which they have already furnished to the extent of 690. By the report of this company, we find that the last year's receipts were 478,435 dollars, against expenditure 335,573 dollars, or a net profit of 142,862 dollars.

A PATENT has been granted in the United States to Mr. Emile Berliner for Electrical Contact Telephones, which invention, Mr. Berliner claims, is similar to the "Microphone," and which he used and described in the year 1877.

A BILL has been introduced in the State Assembly at Albany for the suppression of telegraph poles and the stringing of telephone wires across the tops of houses.

THE POSTAL TELEGRAPHS.—A deputation from the Associated Chambers of Commerce waited upon Lord John Manners, Postmaster-General, a few afternoons since, to impress on his lordship the necessity of adopting modifications of the present postal and telegraph system. Mr. Whitwell, M.P., and Mr. Jacob Behrens, Bradford, stated the views of the deputation as to the improvements that were required in the international and internal telegraphs and postal arrangements. Mr. Whitwell laid stress on the inconvenience which would be caused by the new regulations prohibiting the use of proper names except in their natural meaning, and Mr. Behrens suggested, amongst other things, cheap telegrams, at say 3d. or 6d., which he thought would ultimately add to the revenue of the Post Office. Lord John Manners pointed out that, so far as the members of the deputation had desired modifications of the regulations at present existing with regard to foreign countries, England had no power to alter the conclusion arrived at by a convention which was recently held, and no other convention could be made until all the contracting Powers assented to it. He need not impress upon them the difficulty of bringing such a convention together, considering that foreign countries, even as far away as Japan, were interested in it. He could only recommend them to ascertain how the present system worked, and bring the matter before the next Telegraph Conference that was held. As to the proposed alteration in the telegraph system of England, he could only say at present that he would give the matter his careful consideration. Respecting the Indian mails, he was not sure of the fact, but he thought that the regulations complained of were made by the Indian Postal Union, which was not in any way connected with this department.

MR. W. H. PREECE ON "WHEATSTONE'S TELEGRAPHIC ACHIEVEMENTS."—The evening lecture at the Royal Institution on Friday, February 13, was delivered by Mr. W. H. Preece, the subject being "Wheatstone's Telegraphic Achievements." The three principal telegraphic achievements of Wheatstone were the invention of the Needle, the A B C, and the Automatic instrument. The Needle instrument was patented in 1837, and the A B C in the year 1839. The latter form of instrument was greatly improved, and a new patent granted in 1858. Mr. Preece in his discourse pointed out the various stages of the development of the A B C instrument up to the existing perfect form of apparatus. The Automatic instrument was patented in 1858, but subsequently greatly improved. The apparatus as it now exists, Mr. Preece stated, was capable of, and had actually worked at the rate of 250 words a minute, this speed having been attained between Liverpool and London. By means of "translators" or "repeaters" a high rate of speed could be kept up on very long circuits with submarine cables in circuit.

In speaking of Wheatstone's character, Mr. Preece pointed out that Wheatstone could not be considered to be a great philosopher, but his chief merit lay in his eminent practical nature, that is, in his power of applying his inventions for practical purposes.

TELEGRAPHIC MONEY ORDERS.—We see no reason, says the *Investors' Guardian*, why the Government, having secured the telegraphs, should not make arrangements to use them for this purpose. For instance, it is quite possible, as is the case in Austria and other countries, for one man to send another £10 by telegraph for the same amount which it now costs him to remit that sum by means of a money-order. A post-office order entails the risk of delay.

THE Colonial Office has under consideration a scheme for a telegraphic cable to the Island of Bermuda, the Royal Commission on Colonial Defence having forcibly called attention to the isolated condition of that important station and naval depôt.

LAUNCH OF A NEW TELEGRAPH STEAMER.—On Saturday, the 24th January, there was launched from the yard of Messrs. James Laing, at Sunderland, a new steamer for the West India and Panama Telegraph Company (Limited), London. The *Grappler*, ss., measures 200 feet in length, by 29 feet beam, by 16 feet depth of hold, aud has been specially constructed for cable work. The vessel carries large tanks, has ample coiling space, and will receive her picking-up and paying-out gear in London. The *Grappler* is now at Messrs. R. and W. Hawthorn's receiving her engines. The work is being carried out from the plans and specifications of W. R. M'Kaig and J. Carlton Stitt, consulting engineers to the Company.

THE TELEGRAPH IN AFGHANISTAN.—Mr. C. E. Pitman and Mr. Lake, of the Indian Telegraph Department, have been nominated Companions of the Order of the Indian Empire, for distinguished services in connection with the erection of telegraph lines during the campaign in Afghanistan.

THERE is a rumour that yet another cable to America is projected.—*Herepath's Railway Journal.*

TELEGRAPHIC COMMUNICATION FOR THE WEST COAST FISHING.—Sir James Elphinstone, M.P., has obtained the sanction of the Treasury to have the telegraph carried on from Lochmaddy, in North Uist, to Loch Boisdale, in South Uist. There were considerable difficulties in the way, as the work involved the laying of several short cables. The importance of the fishery in that neighbourhood, however, has resulted in the Post Office being authorised to conclude an arrangement by which the desired extension will be enabled to be carried out. Information as to the early fishing at Barra has become urgently desirable, as it is attended by crews and curers or their agents from Peterhead, Fraserburgh, Buckie, and other ports on this coast.

THE CAPE CABLE.—The Eastern and South African Telegraph Company (Limited) announce the interruption of the Mozambique-Delagoa Bay section of their cable. The fault is reported to be near Mozambique, and the company's repairing vessel has left Aden to restore the communication.

THE American Union Telegraph Company's system has been opened in part. The eastern lines generally are now in operation, and western connections, through to Omaha, will soon be established.—*The Railway Times.*

AN International Meteorological Conference has been held in Sydney, at which it has been arranged to establish a uniform system of weather telegraphy for the different Australian colonies.

AT a meeting of the City Commission of Sewers it has been determined, as an experiment, to try the system of electric street alarm posts or boxes in cases of fire, and the points selected were in Upper Thames Street; Bridge Street, Blackfriars; St. Paul's Churchyard; at the General Post Office; in Gresham Street; Moorgate Street; at the Mansion House; and at the King William Statue, London Bridge.

NEW YORK CITY FIRE DEPARTMENT.—The statistics of the Fire Department show that the percentages of total destruction of buildings by fire were 7, 6½, and 5 per cent. in the years 1866, 1867, 1868 respectively, whereas the percentages in 1877, 1878, and 1879 were but 3·45, 1·14, and 1·6 respectively. This decrease is attributed to the perfected system of fire-alarms now in use.

ACCORDING to present arrangements the *Iris*, *Devastation*, and *Neptune*, are to be completed for sea at Portsmouth by the end of the financial year. It is intended to fit each of these ships with electric bells, the same as fitted to the Royal yachts.

TELEGRAPH WIRES IN NEW YORK.—A general scheme for underground wires in New York has been devised by Mr. R. D. Radcliffe. This scheme includes the re-arranging of the various systems of wires; the adoption of the idea will enable the number of poles which carry the wires at present to be reduced from about 10,000 to 1,600.

A SERIES of courses of lectures illustrating some of the applications of Physics to the Arts has commenced at South Kensington. Captain Abney will lecture on Radiant Energy and its relation to Photography, Prof. Adams on Electrical Measurement in relation to Telegraphy, Prof. Barff on Colour and Pigments in relation to Painting, and Dr. W. Stone on Sound in relation to Music and Musical Instruments. The fee is £1 for each course. The lectures commenced on February 23.

NEUTRALISATION OF SPARKS AT RELAY CONTACTS.—Mr. C. S. H. Small writing to the *Journal of the Telegraph* says:—"In making some experiments with condensers, with a view to reducing the amount of spark at the relay points in a stock quotation system, I made a discovery which may be of interest to your readers, and will, I think, be new to many of them. In our system the relay points are used to open and close circuits containing on an average 20 instruments of 5 ohms each, a line wire with a resistance of about 10 ohms, and about 70 cells of electropoin battery. The spark resulting from the closing and opening of these circuits is very destructive to the relay points, rendering necessary frequent fileing and re-adjustment, as well as causing considerable loss of time in the repetition, by the points being kept wide apart to break the spark.

"In trying to neutralise this spark with condensers of 9½ microfarads capacity, the condenser was connected with one of its sides to one point of the relay and the other side to the other point. The armature lever of the relay is connected with the main battery, and the lower contact with the line. It was found that after making a few vibrations, under these conditions, the relay points would become fused and stuck together tightly so that they had to be pried apart. The discovery referred to above is in the method of connecting the condenser. In the second series of experiments the condenser was connected with one side to the earth direct and the other side to the line wire after it leaves the lower contact point of the relay. The result was that a condenser of 8½ microfarads answers perfectly well, completely removing the spark and allowing of good working with the relay points as close together as on ordinary Morse lines. After a trial of one month no faults have been developed to counterbalance the advantages gained."

IT has been noted that during the present weather crisis the Montsouris electrometers have shown not a single negative reading. This positive state has continued for the last three months. The readings are taken eight times a day.

THE measurement of the resistance of liquids is known to be a matter of some difficulty, as the current causes the electrodes placed in the liquids to polarise and add their resistance to the liquid under measurement. Thus erroneous results may be attained. Herr Niemöller gets over this difficulty by employing a telephone instead of a galvanometer on the Wheatstone bridge used for making the measurements, and sending a rapid series of reversed currents through the apparatus instead of a continuous current; it is found that in the position where the galvanometer shows no deflection the tone in the telephone has a well-marked minimum of intensity. Supposing the liquid resistance has 2,000 units, a variation from it, of only four units, reveals itself in a displacement of the minimum position.

AN improved form of needle for Thomson's Quadrant Electrometer has been devised by Herr Edelmann; the needle, instead of being a flat plate, consists of two quadrants cut vertically from a cylinder. This swings concentrically within another cylinder slit into four quadrants, which replace the usual pairs of flat quadrantal plates. The needle and its attached mirror are supported by a bifilar suspension, and the charge is given to the needle by connecting the cup of concentrated sulphuric acid, into which it dips, with the pole of a Zamboni pile.

THOMSON'S GALVANOMETER.—When electric currents are measured with the aid of Thomson's reflecting galvanometer, the indications read on its graduated scale are found not to be proportional to the values of the currents measured, and to be exaggerated in proportion as those values increase. This cause of error arises from the fact that the angles of deflection of the magnetised needle are doubled by the reflection of the mirror, and consequently it is not the tangents of the real angles of deflection that one reads on the scale, but the tangents of the doubled angles. If it can be assumed without inconvenience that the tangent of the double of a very small angle is twice that of the simple angle, the case is not the same for large angles; and although the deflections of the needles of this class of apparatus are limited, with the aid either of a directing magnet or of derivations, to about 8°, the indications are already sensibly exaggerated at the extremities of the scale which the 8° include. I essayed to remedy this defect by substituting a very fine platinum wire ($\frac{18}{1000}$ in diameter) for the untwisted thread of silk by which the system of needles of the galvanometer are suspended; but the want of proportionality was produced in the opposite sense, and was more considerable. I then had recourse to a bifilar suspension composed of two cocoon-threads very close to one another. The results were almost completely satisfactory. By this second means the errors are not entirely corrected; but they are reduced to less than one-hundredth of the value measured. The verification experiments were made, using the whole extent of the graduated scale, with the aid of three condensers charged from one and the same constant source of electricity. The condensers were first charged and measured separately, and afterwards charged and measured in combination."—A. GAIFFE in *Comptes Rendus*.

LUMINOUS TUBES.—M. Trève, in *Comptes Rendus*, recounts the following experiment:—"Into a large Geissler tube I introduced a Fizeau's condenser. The two poles of the induced current of the Ruhmkorff end at the condenser through the intermediations of the ordinary electrodes of this kind of tubes, which, fused into the glass, are fixed to the eleventh and twelfth sheets of tinfoil. When the induced current passes into the condenser, the tube still containing air at the atmospheric pressure, the usual humming is heard. If vacuum be gradually produced in the tube the humming grows more and more feeble. At last, if air be withdrawn until only a pressure of three or four millims. is left in the tube, the ear can no longer perceive anything; but a brilliant white light appears, springing in the form of beads from the tinfoil of the condenser, and absolutely distinct from the pale and indistinct phosphorescent light of Geissler tubes."

HAVING in view the energetic effects of the secondary battery of Planté, M. D'Arsonval has proposed the construction of a much more powerful condenser. There are two causes which limit the power of Planté's battery—the gaseous state of the reduced metal, that is to say, of the hydrogen, and the cessation of the oxidation of the lead so that the surface of the lead plate is entirely covered with a layer of oxide. This latter effect is much diminished by greatly increasing the area of the metallic plate, whilst the other effect the author gets rid of by substituting for the hydrogen a soluble metal, that is to say, by replacing the water by a salt of zinc. To increase the lead surface he uses very fine lead shot. His secondary couple then consists of a plate of zinc, and one of carbon surrounded by fine shot, in a concentrated solution of sulphate of zinc. A voltaic current is sent through from the carbon to the zinc, effecting deposition of zinc on the zinc, and formation of peroxide of lead on the lead, the sulphuric acid remaining free. With a small couple, containing 1 kg. of fine shot, a Desprez motor was worked four hours. Still better results are got if a layer of mercury be substituted for the zinc plate; the electrolysed zinc forms an amalgam with it, and the couple retains its charge a long time. Its maximum electromotive force was found equal to 2·1 volts.

ELECTRICITY OF THE BLOWPIPE FLAME.—Referring to a supposed discovery by Col. Ross of the magnetic property of the blowpipe flame, Mr. Herbert M'Leod writes to *Nature* on the subject:—"Col. Ross's experiment seemed of such importance that I thought it advisable to repeat it, and it may be of interest to some of your readers to hear of the result and of the way in which my experiment was conducted.

"A compass in a closed box, to prevent the influence of air currents, was placed close to a brass Herapath blowpipe, and after the position of the needle was noted the gas was lighted and air was blown through the flame; no deflection of the needle was observed. As the compass is an old one and there was probably some friction on the pivot, it was replaced by a piece of magnetised watch-spring attached to a mirror, and suspended in a glass case by a single silk fibre; this apparatus being placed on a stone slab, light from a lamp was reflected from the mirror on to a screen. The arrangement was so delicate that the needle was set in oscillation by the movement of the iron rod connecting the blowpipe with the treadle; so, to avoid any possible disturbing cause, the air was supplied by water pressure from a copper gas holder. When the jet was brought near the needle, the flame being either in the magnetic meridian or at right angles to it, not the least movement of the spot of light was perceived, although the screen was at a distance of about eight feet from the mirror.

"As this result is so much at variance with that of Col. Ross, it would be interesting to know exactly how his experiment was performed."

HERR E. WIEDEMANN has recently made further experiments on the phosphorescent or fluorescent light produeed by electric discharges (*Wied. Ann.*, No. 1). Nearly all platino-cyanide double salts show fluorescence under the discharge; but, so long as they were undecomposed, no double fluorescence was observed. When platino-barium cyanide had been traversed by a single discharge, the strong green fluorescent light showed no dichroism, but, after a series of discharges, dichroism appeared. It also occurred when the crystals of that or other platino-cyanide double salts were left a long time *in vacuo* (without electric discharge) whereby they lost water; and the more rapid appearance of dichroism under the electric discharges is attributed to heating of the crystals. Herr Wiedemann opposes Mr. Crookes's view, offering the following proof of its incorrectness:—If the positive current of a Holtz machine be sent through a very thickwalled discharge-tube, and the discharges be made to follow one another in such a rhythm that they are deflected from their course in the tube by the finger, only a weak phosphorescent light appears on the inner side of the tube, but a very bright green light appears on the *outer* side. The non-observation of this before is probably due to the thinness of the tubes commonly used. In narrow, and especially capillary tubes, too, only the inner wall becomes luminous.

M. TRÈVE finds that the dynamic magnet formed by a solenoid of iron wire has its magnetic polarity four times more intense for the same force of current than a solenoid constructed in identically the same manner with a wire of copper or other diamagnetic metal.

HARDENING STEEL.—The engravers and watchmakers of Germany are said to harden their tools in sealing wax. The tool is heated to whiteness and plunged into the wax, withdrawn after an instant and plunged in again, this being repeated until the steel is too cold to enter the wax. The steel is said to become almost as hard as the diamond.

A COMPANY has been incorporated under the title of the "Navigating Telegraphs Company (Limited)." Capital £20,000, in 4,000 shares of £5 each, payable as follows: £1 per share on application and £1 10s. on allotment. The directors are: Sir Philip Haughton Clarke, Bart., W. Cope Devereux, Esq., R.N., F.R.G.S., Colonel W. Wallingford Knollys, F.R.G.S., H. W. Maynard, Esq., A. R. Robinson, Esq., C.E., Nassau J. Senior, Esq. The intention of the Company is to work patents for Steering and Engine Room Telegraphs. It will interest our readers in the trade to hear that the patents are those of Mr. Francis, whose name is too well known for comment to be necessary.

A COMPANY to work Mr. Henley's business, under the title of W. T. Henley & Co. (Limited), was registered on Saturday the 21st inst. The capital has been subscribed by a few friends.

PATENT MAGNETIC WATER METER COMPANY.—A new company has been registered under this title with a capital of £10,000 in £5 shares. It is intended to purchase of Mr. Daniel Backhouse Syers, of 106, Fenchurch Street, the patent rights entitled, "Improvements in apparatus for measuring water or other liquids, applicable also as a current meter and motor;" also to acquire the right to use the said invention in Belgium and Germany.

AN extraordinary prize of 3,000 francs has been awarded by the French Académie des Sciences to Mr. Crookes, F.R.S., in recognition of his recent discoveries in molecular physics and radiant matter.

THE Chinese Government, through the efforts of His Excellency Li Hung Chang, have at length decided to establish a complete system of telephones throughout China; at least, for the present, in that part of China north of the Yang Tse Kiang. Mr. J. A. Betts is now on his way home to make arrangements for carrying out the work. It will be remembered that the Chinese Government have already a telegraph line fron Tientsin to Taku, the stores for the construction of which were sent from this country, and which line was erected by Mr. Betts, with the students of the Imperial Torpedo College, Tientsin—the first successful telegraph line in China—and which may be considered to be the forerunner of the more important work about to be put in hand.

Review.

The Telegram Code, 3rd Edition. By DR. AGER, 50, Wellington Road, Stoke Newington.

IT has been remarked that a second edition of any work tests an author's ability. Granting the truth of this, we feel inclined to add that we regard a *third* edition as a greater evidence of his successful accomplishment of the task he has set himself, especially when we find the work constantly increasing in extent and popularity, as is the case with the "Telegram Code."

The first edition, published in 1875, was out of print in a short time, and many of our readers might have seen advertisements frequently appear offering two or three hundred per cent. above the published price for copies of the work.

The book is so well known that it is not necessary for us to enter into any very minute description of its merits.

Some few characteristics only of the present edition require to be noted.

As in the first edition, a large part of the work is provided with alternate pages containing code words only. Other parts of the book, referring to contracts, markets, offers, orders, shipments, &c., are provided with five columns of code words, in addition to that on the opposite page. It is intended that the sentences attached to the latter shall also apply to the former for any articles in which telegraphers may be specially interested. By this simple device, several thousand sentences may be made to apply to any five articles requiring frequent telegrams, the sixth being left for occasional telegrams.

Very large additions have also been made to the tables of *price* and *quantity* in order to meet the wants of merchants, whose facilities for telegraphing fractional prices, advances or reductions in market quotations, have been largely curtailed by the late Convention. Thus we find every fraction from $\frac{1}{64}$ upwards to a unit of a penny, followed by a further rise of $\frac{1}{32}$ to 1s., and again to other grades upwards to £150,000,000, with blank code words affording facilities for a still further increase. Another feature of the present issue is the addition of Rupee Currency, which, we doubt not, will be welcomed by the large body of merchants trading with India.

To us who are outside the mercantile world, the "Telegram Code" affords many subjects of interest, as the author has contrived to concentrate in his work a large amount of the experience of City and other merchants.

Of the code words it is unnecessary to say anything further than that they are strictly within the lines of the late Conference, and appear to have been most carefully selected.

Correspondence.

To the Editor of THE TELEGRAPHIC JOURNAL.

DEAR SIR,—I see that the practicability of telegraphing by currents from Gramme and other dynamo-electric machines is still being discussed in the electrical journals. It might, therefore, interest your readers to know that this company's instruments have been worked in Paris for about two years past by a Gramme machine and gas-engine with perfect success, and more economically than if batteries were used.

Yours truly,
F. HIGGINS.

Exchange Telegraph Company,
17, Cornhill.

To the Editor of The Telegraphic Journal.

Dear Sir,—With reference to the concluding paragraph of your notice of my patent magnetic cut-off for dynamo-electric machines in your issue of 15th inst., I may tell you that previously to perfecting my patent I experimented with the method you mention, and found it resulted in a signal failure.

In the first place, the electric current will, in obedience to its natural laws in reaching a given point, take the shortest circuit; consequently, if I connect my cut-off with the dynamo, the current from the latter will be so powerful as not only to overcome the cut-off, but will entirely fuse the connections.

Again, if I put a resistance to control the current from the dynamo to the cut-off, when I make use of the rheostat coil to lessen the current from the dynamo to the plating bath I so weaken the current applied to the cut-off that it refuses to act unless the spring of the cut-off is regulated at the same time, according to the current required in the bath. Of course, this could be done, but electro-platers, as a rule, not being skilled electricians, a mistake would sooner or later be made. Apart from this, the waste of time occupied in so regulating the spring of the cut-off would raise an objection from every practical man.

I am, dear Sir, yours faithfully,
Gmo. ZANNI.

47, Holborn Viaduct,
23rd February, 1880.

Proceedings of Societies.

PHYSICAL SOCIETY.—Annual General Meeting, February 14.

Professor W. G. Adams, President, in the chair.

The President read the report for the past year, which showed that the position and prospects of the Society are in every way satisfactory, and that more papers were communicated during last year than in any previous year. The following list of council and officers was elected for the ensuing year, and votes of thanks were given to the President, the Lords of the Committee of Council on Education, and to the Treasurer, Demonstrator, and Secretaries, President Sir W. Thomson, LL.D., F.R.S., Vice-President (who has filled the office of President) Professor W. G. Adams, M.A., F.R.S., Vice-Presidents, Professor R. B. Clyton, Dr. Huggins, Lord Rayleigh, Dr. Spottiswoode; Secretaries, Professor Reinold, and W. Chandler-Roberts, F.R.S.; Treasurer, Dr. Atkinson; Demonstrator, Professor Guthrie; and Members of Council, Capt. Abney, Walter Bailey, M.A., J. H. Cotterill, F.R.S., Dr. Warren de la Rue, Major Festing, R.E., Professor G. C. Foster, Professor Fuller, Dr. J. Hopkinson, Dr. Schuster, G. Johnstone Stoney, F.R.S.; Honorary Member, J. E. R. Clausius.

After this business the meeting resolved itself into an ordinary one, and the following new members were elected: Senor Roig y Torres, of Barcelona, Mr. Mollison, Mr. Hare, Mr. J. C. Lenis, Miss Caroline Martineau.

A paper "On a Quartz and Iceland Spar Spectroscope Corrected for Chromatic Aberration" was then read by Dr. W. H. Stone. The spectroscope consists of two Iceland spar prisms and a quartz train. It differs in no respect from those ordinarily made, except in the fact that the object glasses of the telescope and collimator are doublets, with a positive lens of quartz and a negative of Iceland spar. The latter has a dispersive power so far greater than that of quartz that an approximation to achromatism may be easily obtained. In a spectrum there is less fear of indistinctness from superposition of images than in a telescope; but a greater amount of focusing is required with unachromatic lenses, insomuch that lines in the field at one time need alteration to obtain distinctness. Moreover, it is an obvious advantage to transmit the whole of the rays coming from the collimator as nearly as possible parallel through the intra-objective space and the prisms. The object glasses were made by Mr. Ahrens about four years ago, and sent to Professor Macleod. They were put aside, but have been recently re-mounted owing to M. Cornu having recently published a similar device.

A paper "On an Automatic Switch for Telephone Circuits" was then read by Dr. Wynne. The object of the switch was to enable any client of a telephone exchange to communicate with any other through the central office without the need of an assistant at the office. Mr. Varley and Professor Ayrton criticised the device, and the latter thought that the contacts might not be always reliable.

Professors Ayrton and Perry then read a note on their "Theory of Terrestrial Magnetism." Professor Rowland of Baltimore had pointed out an error in their calculation which vitiated their results, and they, therefore, admitted that the charge of statical electricity on the surface of the earth assumed by them as competent to account for the earth's magnetism, was not sufficient to account for the whole, but only a portion of that magnetism. Nevertheless, they thought that the changes in the distribution of such a charge due to changes in the condition of the dielectric medium between the earth and the sun might account for the observed perturbations in the magnetic elements.

THE SOCIETY OF TELEGRAPH ENGINEERS.

The ordinary general meeting of this Society was held on Wednesday, February 25th, Mr. W. H. Preece, President, in the chair. The minutes of the last general meeting having been read and confirmed, the President rose and stated that he wished to correct a statement made by him in his inaugural address, viz., that microphonic telephone transmitters had superseded those of other forms in certain of the telephonic systems now in operation. He wished to say that this was not the case with Edison's system, the transmitter employed by that gentleman being very slightly different from that originally employed by him. The President's statement in his address should, therefore, not apply to Edison's system.

A discussion on Mr. Eden's paper, on "Morse Signalling by Magneto-Electric Currents," was then invited, but no remarks having been made on the subject, a discussion was invited on Mr. **WILSON**'s paper, on "Compensating Induction in Telegraph Wires."

Mr. J. T. **HILL** stated that the amount of condenser capacity required for balancing duplex circuits varied with the state of the weather, a greater amount being required in fine than in damp weather. A number of circuits and the condenser power required for each in various weathers were enumerated.

Mr. **WILLOUGHBY SMITH** gave a description of some experiments made on a portion of the French Atlantic Cable when the latter was lying in the tanks on board the cable ship. One thousand miles of this cable was coiled in one tank, then a considerable quantity in two other tanks, and the remainder of the length, viz., 200 miles, was coiled on the top of the 1,000 miles. The induced effect produced by the two lengths of cable on one another in the one tank produced a distinct kick in the signals transmitted through the whole cable.

PROFESSOR AYRTON gave some formulæ representing the effect of the different kinds of induction.

Mr. A. J. S. **ADAMS** pointed out that electro-magnetic induction was sudden in its effects, and electrostatic induction prolonged, arguing from this fact that Professor Ayrton's formulæ were possibly incorrect.

Mr. C. A. **MORGAN** pointed out that the condenser capacity required for working a No. 8 was the same as for a No. 4 wire. He also pointed out that in the recent form of Wheatstone's receiver with short electro-magnets compensating resistances were not required.

PROFESSOR HUGHES stated that since 1868 a commission had been sitting in France, the object of which had been to endeavour to get rid of the effects of induction between wire and wire; but little progress had been made by the commission as yet.

The **PRESIDENT** argued that the capacity of a line varied with the amount of moisture in the atmosphere, this being shown by the fact that the working speed was less in wet than in fine weather.

A paper by Mr. J. B. **STEARNS**, on "A Fault in the Construction of Differential Galvanometers," was then read by the Secretary.

In this paper it was shown that in winding mirror differential galvanometers the parallel winding of the wire from two bobbins produced an unequal arrangement of the two wires, so that although the sum of all the effects of the turns of one wire was equal to the sum of the effects from the other turns, these effects were unequally distributed, and, consequently, the difference of the effect on the magnetic needle was only *nil* when the needle was in a particular position within the coil, by slightly shifting the needle the balance was thrown out.

In the discussion which followed the reading of the paper, Messrs. **KEYSER**, **FOSTER**, and **STROH** took part.

The meeting then adjourned.

At the next meeting an exhibition of electric-light apparatus will be held.

New Patents—1880.

458. "An improved method of and apparatus for extracting or recovering metals from their ores." W. R. **LAKE**. (Communicated by A. E. Tichenor.) Dated Feb 2. Complete.

553. "Improved regulators or lamps for the electric light." G. W. **WIGNER**. Dated Feb. 9.

573. "Improvements in apparatus for closing or emptying water pipes or other fluid conduits, parts of which improvements are applicable generally for shunting electric circuits." H. J. **HADDAN**. (Communicated by F. Fried.) Dated Feb. 10.

578. "Improvements in electric lamps, and in the method of manufacturing the same." T. A **EDISON**. Dated Feb. 10.

583. "Improvements in the means and apparatus for conveying persons or objects from one locality to another by electric motive power." C. H. **SIEMENS**. (Communicated by E. W. Siemens.) Dated Feb. 10.

602. "Improvements in the utilisation of electricity for light, heat, and power, being an improved system and means for the generation, regulation, distribution, measurement, and translation of electricity into light, heat, or power." T. A. **EDISON**. Dated Feb. 11.

624. "Improvements in or applicable to machinery, or apparatus for the manufacture of engine packing, insulated telegraph wires, and other similar manufactures." G. F. **JAMES**. Dated Feb. 12.

630. "Lighting by electricity." Hon. R. T. D. **BROUGHAM**. Dated Feb. 13.

631. "Improvements in and applicable to telephones, and to phonographic apparatus connected therewith." F. H. F. **ENGEL**. (Communicated by W. Klinkerfues.) Dated Feb. 13.

636. "Producing the electric light." A. M. **CLARK**. (Communicated by C. L. Pilleux.) Dated Feb. 13.

638. "Electric telegraph apparatus." W. R. **LAKE**. (Communicated by B. Thompson and C. Selden.) Dated Feb. 13. Complete.

671. "An electric telegraph for railway trains." G. **DALSTRÖM**. Dated Feb. 16.

695. "Improvements in and relating to cables of conductors for telephonic and telegraphic purposes." W. R. **LAKE**. (Communicated by C. E. Chinnock and J. De H. Harrison.) Dated Feb. 17.

699. "Improved apparatus for preventing the injurious effect of induced or escaping electrical currents in telephonic or telegraphic lines." W. R. **LAKE**. (Communicated by C. E. Chinnock and J. De H. Harrison.) Dated Feb. 17.

725. "Improved means and apparatus for distributing currents for electric lamps or candles." J. **IMRAY**. (Communicated by La Société Génerale d'Electricité.) Dated Feb. 18.

751. "Improvements in and relating to telegraph wires, and the method or process of manufacturing the same." F. J. **CHEESEBOROUGH**. (Communicated by A. K. Eaton.) Dated Feb. 20.

752. "Improvements in and relating to magnets and telephones and combinations of magnets with telephones." F. J. **CHEESEBOROUGH**. (Communicated by A. K. Eaton.) Feb. 20.

756. "Electrical conducting wires." A. W. **REDDIE**. (Communicated by H. Menier.) Dated Feb. 20.

ABSTRACTS OF PUBLISHED SPECIFICATIONS, 1879.

2016. "Compound for insulating." **FREDERICK SANDERS** and **LUDWIG DANCKWERTH**. Dated May 21. 2d. Has reference to an insulating compound, called "electra compound," to be used either alone or in combination with india-rubber and gutta-percha, or similar resins. It contains vegetable-tar oil, coal-tar oil, linseed oil, ozokerit, spermaceti, and sulphur.

2110. "Producing light and heat by electricity." C. W. SIEMENS. Dated May 27. 10d. This has reference to previous patent of Oct. 22, 1878, wherein is described the cooling of the terminal of an electric lamp by means of a stream of water passed through a cavity formed in the terminal. The arrangement as now patented consists of a vertical wire, preferably of iron for the negative terminal, enclosed within a thin copper tube, which is surrounded by an outer tube or casing of larger diameter, so that between the two tubes there is an annular space through which water is made to flow. By connecting the upper and lower ends of the casing by tubes with the upper and lower parts of a water-cistern the heating of the water at the terminal causes a circulation which is sufficient for keeping the terminal cool.

2267. "Illuminating by electricity." GEORGE GROUT and RICHARD SENNETT. Dated June 9. 2d. This invention is intended to increase the illuminating power of the electric arc by passing through or around the electrode gases or vapours rich in carbon or other substances in a fine state of division, by which means they become incandescent, and so increase the light.

2321. "Production and regulation of electricity for illumination." J. DEVONPORT FINNEY ANDREWS. Dated June 11. 6d. Consists of a dynamo machine, the parts of which are largely exposed to the air; of a commutator for varying electric power, and for varying and distributing electric power. It also relates to an electric lamp, the most notable feature of which is presenting the voltaic arc at the edges of parallel discs or concentric tubes, causing the arc to move round these edges by induction from several adjacent convolutions of the conducting wire of the lamp.

2339. "Obtaining light by electricity." A. M. CLARK. (A communication from the firm of A. de Méritens & Co.) Dated June 12. 6d. Relates to a multiple carbon "burner" for the production of the electric light. With this "burner" the arc is not formed between two but between a number of electrodes, by deriving the principal current through as many branches as there are conductors. This derivation is effected under such conditions that the tension of each derivation is proportional to the resistance of the arc interposed in it. Or instead of derivations of the principal current, secondary currents may be used produced by the inductive action of the primary current. These induced currents may be merely those generated in the intermediate carbons which the current passes, the burner in that case working without any other device than that necessary to send the current through the two outside carbons.

2402. "Electric lights and apparatus for developing electric currents." THOMAS ALVA EDISON. Dated June 17. 10d. Consists of the incandescent lamp and electric generator already described.

2481. "Transmission of power by electricity." JOHN HOPKINSON. Dated June 21. 6d. Relates to effecting the reversal of the direction of motion of the armature or revolving portion of the dynamo-electric or magneto-electric machines when used as motors, by changing the position of the points of contact of the brushes, or equivalent devices, and commutator or collector.

2493. "Fire alarm." L. ALEXANDRE BRASSEUR and OCTAVE ANTOINE ERNEST DEJAER. Dated June 21. 6d. Claims a tube contact maker charged with wax, paraffin, or other solid, fusible just below the point at which induction is desired to be given.

2543. "Manufacture of carbon candles or points for electric lighting." FELIX JOHN DE HAMEL. Dated June 25. 4d. Relates to the manufacture of candles or points, or plates of carbon combined with wire or metal.

2554. "Producing motive power for the rotation of magneto machines." J. BANTING ROGERS. Dated June 25. 6d. The object of this invention is the production of motive power for the rotation of magneto machines used for lighting purposes by mechanism governed and controlled by a falling body or column of water.

2600. "Receiving apparatus for telephonic communication." FREDERICK ALDRIDGE ORMISTON. (A communication from abroad by H. McIntire.) Dated June 27. 2d. Relates to a form of friction telephone. (*Provisional only*.)

2629. "Submarine telegraph cable." AUGUSTE BLONDOT and JULES BOURDIN. June 30. 4d. The cable is composed of a single copper conductor, covered with several insulating coatings. The first of these, in contact with the conductor, being of gutta-percha, the second of caoutchouc, the third of gutta-percha, the fourth of caoutchouc, the fifth of gutta-percha, mineralised by a mercurial salt. The cable is further surrounded by a covering of tarred hemp.

2744. "Electric lamps." GEORGE WHYTE. July 5th. 6d. Has reference to improvements in the construction of electric lamps or lights, especially with revolving disc electrodes or carbons, and of the moving parts or mechanism for revolving these, and producing the electric arc and light between them, with or without an optical centre, being improvements upon and simplication of an invention previously patented, the number of said patent being 5152, 1878.

2769. "Electric lighting." H. E. NEWTON. Dated July 7th. 2d. (A communication from H. Whiteside Cook, of Niederdorf Tyrol.) Relates to an apparatus, consisting of a drum, so arranged as to send a current to several lamps in succession, and revolving at such a speed that the intervals between the flashes of light shall be so short as to produce the optical illusion of the said light being continuous. (*Provisional only*.)

2905. "Galvanic battery." CHARLOTTA HELENA CARLSON. Dated July 16. 2d. Consists of an arrangement of zinc and copper plates, or other suitable elements, placed parallel to each other in a compact and suitable form, with a specially retained exciting salt or basic acid between them of such a character that when combined with a slightly acid or saline solution (such as the perspiration of the body) a slight and gentle electrical current is produced, the body completing the circuit between the positive and negative poles.

3778. "Manufacture of telegraph cables." W. R. LAKE. (A communication from Joseph McTighe and Philip Arbogast.) Dated September 19. 6d. Relates to the enclosing of wires or cables with glass, or other vitreous covering, to protect them from the atmosphere, or to insulate them for electrical use. It also relates to a coupling for connecting sections of the said wires or cables, these being especially suitable for underground telegraphs.

3843. "Electrical signalling apparatus." A MELVILLE CLARK. (A communication from W. Hadden, of New York.) Dated September 24. 6d. Relates to a signalling device consisting of a non-conducting trough, having two wires connected with two corresponding series of exposed contact points in the bottom of the trough in combination with a separate metallic circuit closer, having a bifurcated end; to a rheostat, formed of a non-conducting tube filled with carbon powder to adapt it to be applied to the circuit wire of a battery; and to the combination of a local circuit and a rheostat with the line circuit of a district telegraph signalling apparatus.

City Notes.

Old Broad Street, Feb. 26th, 1880.

THE INDIA RUBBER, GUTTA PERCHA, AND TELEGRAPH WORKS COMPANY, LIMITED.—The sixteenth ordinary general meeting of the above Company was held on February 12th, at the Cannon Street Hotel, Mr. GEORGE HENDERSON in the chair. A resolution for the adoption of the report (*see* abstract in THE TELEGRAPHIC JOURNAL of February 15th) was proposed by the CHAIRMAN, who said the Company's works were in an excellent condition. One drawback, however, was the advance in the price of raw material, while they found a difficulty in persuading purchasers to pay more than formerly. The resolution was seconded by Mr. SILVER, when Dr. H. SMALL moved an amendment that the report be not adopted, and called attention to the fact that the directors were continually issuing debentures, and asked whether that issue was to be limited. The Board were also frequently writing off sums for depreciation, but the value of their property was not apparently increased. The directors' remuneration he also considered exorbitant, as they were receiving £5,000 between them per annum. The amendment was seconded by Dr. HANCOCK, who agreed with the previous speaker, and compared the action of their directors with those of the Telegraph Maintenance Company, who had voluntarily reduced their own remuneration at a period of depression, and he, therefore, called upon the Board to follow that example. The CHAIRMAN, in reply, stated that the issue of debentures was limited, and further, that with regard to the directors' remuneration, that was fixed by the shareholders, who had it in their power to make any alteration they thought fit. The amendment was then formally put to the meeting, and rejected with but two dissentients, and the original resolution declared carried.

CUBA SUBMARINE TELEGRAPH COMPANY, LIMITED.—The seventeenth ordinary general meeting of this Company was held on February 18th, at the offices, Old Broad Street, Mr. T. HUGHES, Q.C., presiding. The CHAIRMAN, in moving the adoption of the report (an abstract of which appeared in our last issue), referred with satisfaction to the gratifying increase in their business. They had again carefully considered whether they could declare an increased dividend on the ordinary shares, and had come to the conclusion that, for the present, it would be more judicious not to do so. They thought they would not be in a thoroughly safe position till they had a reserve fund of £50,000. The Company was in the most satisfactory position, and their prospects were very encouraging. The motion was seconded and adopted unanimously, and the dividend recommended was declared, after an amendment, that a bonus of 1 per cent. in addition should be paid, had been lost. The meeting then separated.

THE SUBMARINE TELEGRAPH COMPANY.—The half-yearly meeting of the proprietors was held at the City Terminus Hotel, Cannon Street, on the 17th inst., Sir J. CARMICHAEL, Bart., in the chair. The SECRETARY read the notice convening the meeting, the report being taken as read. It stated that, in comparing the accounts for the six months ending 31st December, 1879, with those for the corresponding period of 1878, it will be seen that there has been an increase in the receipts, while a small decrease has occurred in the cost of repairs to cables. The net result of the business for the six months just passed shows a sum of £35,084 6s. 8d. belonging to the Chartered Company, which enables the directors to recommend a dividend at the rate of 18½ per cent. per annum, and to add £2,550 1s. 3d. to the reserve fund. The proprietors are probably aware that a cable between France and America has recently been laid down, and opened for traffic by the Paris and New York Telegraph Company. The directors have agreed upon terms with the managers of that Company for placing a cable across the Channel, to land at Penzance, so as to establish another telegraphic route between England and America; and the Paris and New York Company are negotiating with Her Majesty's Postmaster-General for the use of a land line, from London to the coast, to be placed in connection with the cable. The general introduction of a word rate for European correspondence will be made on the 1st April next, which, no doubt, will cause some increase in the expenses of the Company; but, on the other hand, the directors anticipate a considerable augmentation in the number of messages, as they believe that the public will readily avail themselves of the great advantages afforded by the new tariffs. The CHAIRMAN said it really gave him sincere pleasure on that occasion of meeting them that he had not to preface the few remarks he had to make with the usual statement as to depression of trade and commerce, which he believed that the chairmen of companies had had to do for some years past. He believed that the turn in the tide had come, and that they might expect better times. There was one subject he had to say a few words on. In the last three months they had ceased to publish the monthly statement of their traffic, which they had usually done. There had been a slight disagreement between themselves and the Post Office as to a charge of certain rates on the Continent. Until that was settled they thought it might only be illusory to them to publish the statement, and they, therefore, stopped the publication. He need hardly remark that their relations with the Post Office had always been of a most friendly nature, and the present was only a little question of account, which he had no doubt would be settled in an amicable manner. He drew attention to that because, when he put the motion for their approval, it would stand as follows:—"That the report and accounts now read, with the addition of the words 'exclusive of a sum in suspense claimed from the Post Office,' following the words 'to amount received during the half-year,' in the statement of joint earnings, be received and adopted." Their traffic was most satisfactory, and they had every reason to look forward to the current half-year being quite as good as last. He then put the resolution as above. It having been seconded, the CHAIRMAN, in reply to a shareholder, said that the expense of the new cable would be entirely borne by the Paris and New York Telegraph Company. It would be laid from a point near Brest to a point near Penzance. The cable was the property of the Submarine Telegraph Company, but the other company would lay the cable under the supervision of this Company, whose engineer would be on board the ship. The cable would be laid by arrangement with the Submarine Company, by which they would receive from the other company a considerable sum. He should think that the distance would be about ninety miles. He then put the resolution, and it was carried unanimously. Continuing, he moved "That, in accordance with the recommendation of the directors, a dividend for the half-year ending 31st December, 1879, at the rate of 18½ per cent. per annum, less income-tax, on the capital of the Company, be declared, and become payable on and after the 1st of March next." The motion, having been seconded, was carried unanimously. A vote of thanks was passed to the chairman and directors. The CHAIRMAN, in acknowledging the compliment, expressed a hope that next half-year they would be able to lay before the shareholders an equally satisfactory report. The proceedings then terminated.

THE DIRECT UNITED STATES CABLE COMPANY, LIMITED.—The report of the directors for the six months ending 31st December, 1879, states that the revenue for the half-year, after deducting out-payments, amounted to £120,445 8s. 6d., against £89,943 14s. 8d. (after similar deductions) for the corresponding half-year of 1878, being a difference of £30,501 13s. 10d. in favour of the half-year under review. The working and other expenses, including interest on debentures, amounted to £25,001 3s. 6d., leaving a balance of £95,444 5s. as the net profit of the half-year; making, with £2,345 1s. 5d. brought forward from the previous half-year, a total balance of £97,789 6s. 5d. For the corresponding half-year of 1878 the working expenses and other payments amounted to £21,748 9s. 11d. Interim dividends of 1¼ per cent. each for the quarters ending 30th September and 31st December, 1879, together amounting to £30,355, have been declared and paid. The directors have, after mature deliberation, considered it expedient in the permanent interests of the Company to add a further substantial amount to the reserve fund, and have accordingly placed to the account of that fund a sum of £48,942 2s. 9d., thereby increasing it to £150,000. The sums of £1,900 on preliminary, liquidation, and arbitration account, and £914 7s. 1d., the cost of removing spare cable, together amounting to £2,814 7s. 1d., have been written off, and £15,677 16s. 7d., the balance of the £97,789 6s. 5d. mentioned above, is carried forward. The cables are now, and have been during the half-year, in good working order without any interruption. The £100,000 debenture loan has been placed, and the proceeds have been applied in completing the measures necessary on taking up the 3,813 shares of the dissentients, and paying off the £17,300 seven per cent. debentures of the old Company. The residue puts the capital account of the Company on a thoroughly satisfactory footing.

THE TELEGRAPH CONSTRUCTION AND MAINTENANCE COMPANY, LIMITED.—The report states that, after charging interest on the debentures, the accounts for the year exhibit a net profit of £98,988, making a total of £158,341, with the sum brought down. An interim dividend of 5 per cent. has already been paid, and it is now proposed to pay 15 per cent., making a total dividend for the year of £2 8s. per share, or 20 per cent. The sum left to be carried forward is £68,701. During the 12 months the Company manufactured 6,917 miles of cable, including the duplicate line, 2,441 miles in length, between Penang and Port Darwin, and the line, 3,845 miles, from Aden to Natal.

The following are the final quotations of telegraphs:—Anglo-American, Limited, 60-60½; Ditto, Preferred, 88½-89½; Ditto, Deferred, 32¼-32¾; Brazilian Submarine, Limited, 7¾-8¼; Cuba, Limited, 9-9½; Cuba, Limited, 10 per cent. Preference, 16½-17; Direct Spanish, Limited, 2-2½; Direct Spanish, 10 per cent. Preference, 11¼-11¾; Direct United States Cable, Limited, 1877, 11¼-11½; Eastern, Limited, 8⅞-9⅛; Eastern 6 per cent. Pieference, 12-12¼; Eastern, 6 per cent. Debentures, repayable October, 1883, 103-106; Eastern 5 per cent. Debentures, repayable August, 1878, 101-103; Eastern, 5 per cent., repayable Aug., 1899, 101-103; Eastern Extension, Australasian and China, Limited, 8⅞-9⅛; Eastern Extension, 6 per cent. Debenture, repayable February, 1891, 105-108; 5 per cent. Australian Gov. Subsidy Deb. Scrip, 1900, 100-102; Ditto, registered, repayable 1900, 101-103; German Union Telegraph and Trust, 8½-9; Globe Telegraph and Trust, Limited, 5½-5¾; Globe, 6 per cent. Preference, 11¼-11½; Great Northern, 9⅛-9⅜; Indo-European, Limited, 24-26; Mediterranean Extension, Limited, 3-3½; Mediterranean Extension, 8 per cent. Preference, 10¾-11¼; Reuter's Limited, 11-12; Submarine, 235-245; Submarine Scrip, 2⅛-2⅜; West Coast of America, Limited, 2⅛-2⅜; West India and Panama, Limited, 1⅞-2⅛; Ditto, 6 per cent. First Preference, 7¾-8¼; Ditto, ditto, Second Preference, 7-7½; Western and Brazilian, Limited, 7⅝-7⅞; Ditto, 6 per cent. Debentures "A," 98-101, Ditto, ditto, ditto, "B," 97-100; Western Union of U.S. 7 per cent., 1 Mortgage (Building) Bonds, 120-125; Ditto, 6 per cent. Sterling Bonds, 105-107; Telegraph Construction and Maintenance, Limited, 35½-36½; Ditto, 6 per cent. Bonds, 104-108; Ditto, Second Bonus Trust Certificates, 2⅞-3⅛; India Rubber Co., 13-13½; Ditto, 6 per cent. Debenture, 106-108.

TRAFFIC RECEIPTS.

Name of Co., with amount of issued capital, exclusive of preference and debenture stocks.	Anglo-American Co. £7,000,000.	Brazilian Sub. Co. £1,300,000.	Cuba Sub. Co. £160,000.	Direct Spanish Co. £116,379.	Direct U.S. Co. £1,213,900.	Eastern Co. £3,697,000.	Eastern Ex. Co. £1,997,500.	Gt. Northern Co. £1,500,000.	Indo-Euro. Co. £425,000.	Submarine Co. £338,225.	West Coast America Co. £300,000.	Western and Brazilian Co. £1,398,200	West India Co. £883,210.
	£	£	£	£	£	£	£	£	£	£	£	£	£
January, 1880 ...	*	a 15,869	3,200	... ...	*	48,887	28,009	17,280	... ...	*	... ...	13,534	5,307
January, 1879 ...	50,400	13,778	3,000	951	16,800	39,226	24,695	13,856	... ...	9,064	2,125	*	5,492
Increase	... ...	2,091	200	... ...	... ...	9,661	3,314	3,424	... ...	... ...	... ...	... ...	... ...
Decrease	... ...	... ..	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	185

* Publication of receipts temporarily suspended. *a* Five weeks.

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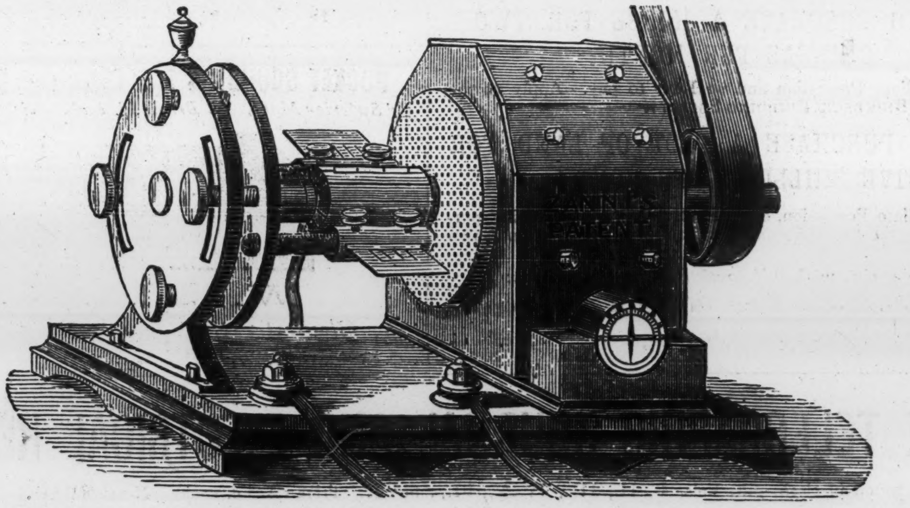

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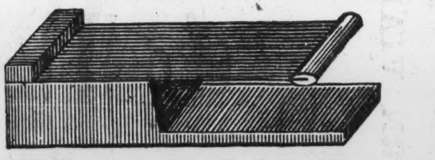

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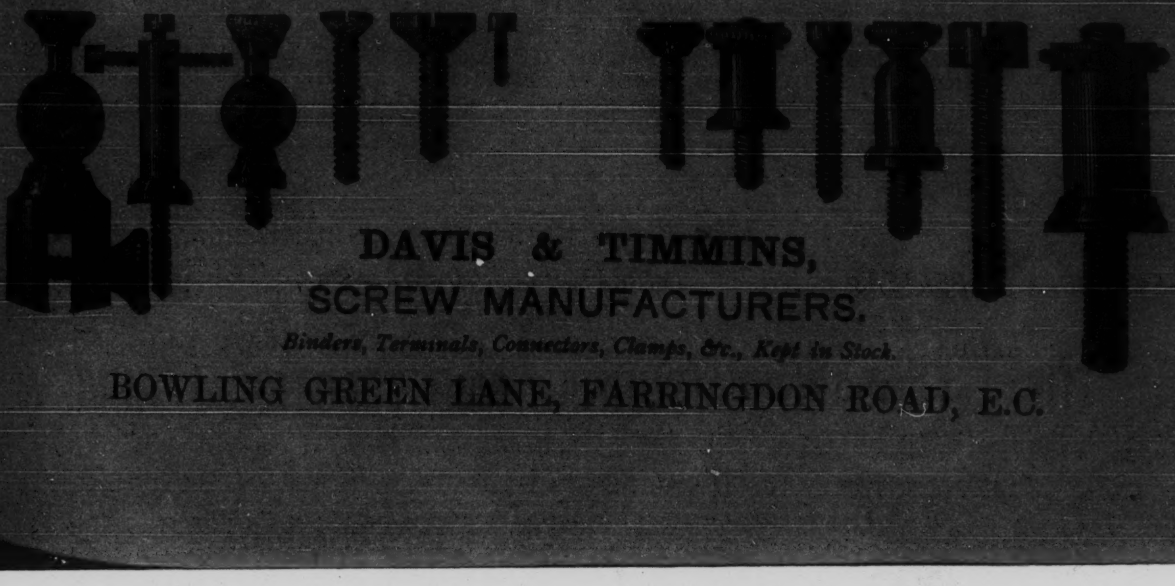

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